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ENGINEERING REPORT
FOR
COMPARISON OF COSTS
OF
ALTERNATE LINES
ON
INTERSTATE ROUTE 15

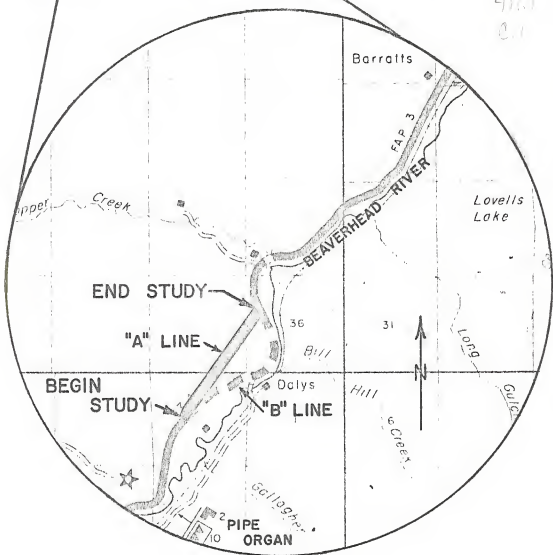
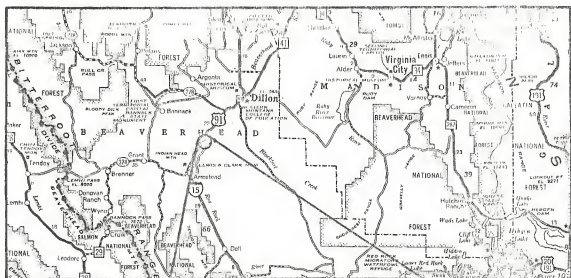
BARRATTS SOUTH

PREPARED BY
MONTANA STATE HIGHWAY COMMISSION
INTERSTATE DIVISION
APRIL 3, 1961

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ENGINEERING REPORT FOR COMPARISON OF COSTS BARRATTS SOUTH



ALTERNATE LOCATIONS STUDIED

ENGINEERING REPORT FOR COMPARISON OF COSTS
ON INTERSTATE ROUTE 15
BARRATTS SOUTH
April 3, 1961

INTRODUCTION

This report was prepared to compare the relative merits of two alternate locations for Interstate 15 on the Barratts South project. The alternate locations in question are in the immediate vicinity of Dalys, a siding on the Union Pacific Railroad approximately 12 miles south of Dillon. The factors evaluated in this report were construction cost, maintenance costs, and road user costs.

The estimated 1975 DHV for this section of Interstate 15 is 230, with 15% trucks.

LINE DESCRIPTIONS

The south common point of the two lines (Station 825) is a point near the north end of the presently proposed Pipe Organ N & S project. The north common point (Station 900 - "A" Line = Station 915 - "B" Line) is a point near a county bridge approximately one mile north of Dalys.

The "A" Line follows a direct line between the two common points, and in doing so crosses a mountain which rises about 400 feet above the valley floor. Because of the sharp ascent and descent required, a four-lane roadway with a flush median was used. No structures, interchanges, or other special features are involved on the "A" Line. The length of this line is 1.42 miles.

The "B" Line, which was approximately the line used in the 108(d) and 104(b) Estimates, generally follows present US 91 between the common points. It is 0.28 mile longer than the "A" Line, but follows a water level grade along the Beaverhead River. A two-lane roadway was used on this line. Between Stations 875 and 910 the "B" Line runs through a constricted canyon with a high rock cliff on the northwesterly side. In order to build the Interstate on the "B" Line approximately 3600 feet of the Union Pacific Railroad must be relocated, and approximately 4000 feet of the Beaverhead River must be channel changed. The length of the "B" Line is 1.70 miles.

CONSTRUCTION COSTS

Earthwork quantities for the "A" Line were computed from a centerline profile. Earthwork quantities for the "B" Line were obtained from plotted cross-sections. A higher unit price for earthwork was applied on the "A" Line because a considerable amount of rock excavation is expected on this line.

A 4-inch plant-mix bituminous surface with appropriate base course was used on both lines. The \$75,000 which is estimated to cover moving the Union Pacific Railroad covers all items except grading. The 800,000 cubic yards of grading on the "B" Line

includes grading for the railroad move, the channel change, and the Interstate Highway.

On the remaining construction items, 1959 Montana average low bid prices were applied. A detailed breakdown of construction costs on the two lines is shown on Page 3.

Total construction costs were broken down into annual costs, using a 4% Capital Recovery Factor and estimated lives as shown on Page 5.

MAINTENANCE COSTS

Maintenance costs were estimated on an annual basis and are tabulated on Page 4.

ROAD USER COSTS

Road user costs were estimated on an annual basis using the adjusted average ADT for the next 20 years. Computations were based on the manual "Road User Benefit Analyses for Highway Improvements", published by the American Association of State Highway Officials, with operating costs adjusted to current local prices.

CONCLUSIONS

The following conclusions can be drawn from this report:

1. Construction costs favor the "B" Line.
2. Maintenance costs favor the "B" Line.
3. Road user costs favor the "A" Line.
4. The summary of annual costs (annual construction cost plus annual maintenance costs plus annual road user costs) favors the "B" Line by \$43,100.
5. It is recognized that the channel change of the Beaverhead River on the "B" Line will have a somewhat detrimental affect on fish habitat. It must be concluded, however, that the expenditure of over a million dollars to alleviate this condition is not justified.

The cost differential between the "A" Line and the "B" Line will amount to nearly one million dollars over the next 20 years. On the basis of these investigations, evaluations and considerations, the "B" Line is recommended as the best location for Interstate 15 in this area.

BARRATTS SOUTH
CONSTRUCTION COSTS "A" LINE
 (1.42 miles - 4-Lane)

GRADING, 2,800,000 Cu. Yds. at \$0.50 -----	\$1,400,000
DRAINAGE, 1.42 miles at \$6794 per mile -----	9,600
BASE AND SURFACE, 1.42 miles at \$84,850 per mile -----	120,400
MEDIAN GUARDRAIL, 1.42 miles at \$29,178 per mile -----	41,400
SHOULDER GUARDRAIL, 2.0 miles at \$16,700 per mile -----	33,400
MISCELLANEOUS CONSTRUCTION ITEMS -----	17,800
 SUBTOTAL, CONSTRUCTION ITEMS -----	 \$1,622,600
PRELIMINARY ENGINEERING (4.8% of Subtotal) -----	77,900
CONSTRUCTION ENGINEERING & CONTINGENCIES (10% of Subtotal) -----	162,300
RIGHT OF WAY -----	13,000
UTILITIES -----	11,000
 TOTAL -----	 \$1,886,800

BARRATTS SOUTH
CONSTRUCTION COSTS "B" LINE
 (1.70 miles 2-Lane)

GRADING ¹ , 1,800,000 Cu. Yds. at \$0.40 -----	\$ 320,000
DRAINAGE, 1.70 miles at \$4529 per mile -----	7,700
BASE AND SURFACE, 1.70 miles at \$55,939 per mile -----	95,100
SHOULDER GUARDRAIL, 1.0 miles at \$16,700 per mile -----	16,700
MISCELLANEOUS CONSTRUCTION ITEMS -----	29,600
 SUBTOTAL, CONSTRUCTION ITEMS -----	 \$ 469,100
PRELIMINARY ENGINEERING (4.8% of Subtotal) -----	22,500
CONSTRUCTION ENGINEERING & CONTINGENCIES (10% of Subtotal) -----	46,900
RIGHT OF WAY -----	11,300
UTILITIES -----	15,000
RAILROAD MOVE ² -----	75,000
 TOTAL -----	 \$ 639,800

¹Includes grading quantity in railroad move, channel change, northbound lanes, and frontage road.

² Includes all costs involved in relocating U.P.R.R. except grading.

BARRATTS SOUTH

ANNUAL MAINTENANCE COSTS

"A" LINE

1.42 miles 4-Lane Interstate at \$2500 per mile -----	\$3,600
1.00 mile PTW (as Frontage Road) at \$500 per mile -----	500
TOTAL -----	\$4,100

"B" LINE

1.70 miles 2-Lane Interstate at \$1500 per mile -----	\$2,600
1.00 mile Frontage Road at \$500 per mile -----	500
TOTAL -----	\$3,100

ANNUAL ROAD USER COSTS

PRESENT ADT = 885 VEHICLES
FUTURE ADT = 2185 VEHICLES
AVERAGE ADT = 1535 VEHICLES

15% Trucks - Assume 1 Truck = 3.5 Cars
AVERAGE ADT = 2110 Equivalent Cars

"A" LINE

2110 X 1.42 X \$.0964 X 365 = \$105,400

"B" LINE

2110 X 1.70 X \$.0973 X 365 = \$127,400

BARRATTS SOUTH
SUMMARY OF ANNUAL COSTS

DESCRIPTION	ESTIMATED LIFE	4% CRF	"A" LINE		"B" LINE	
			TOTAL	ANNUAL	TOTAL	ANNUAL
CONSTRUCTION COST						
Grade and Drain	40	.0505	\$1,409,600	\$ 71,200	\$327,700	\$ 16,500
Base and Surface	20	.0736	120,400	8,900	95,100	7,000
Right of Way	50	.0465	13,000	600	11,300	500
Utilities	40	.0505	11,000	600	90,000	4,500
Miscellaneous	30	.0578	92,600	5,400	46,300	2,700
Engineering & Contingencies	40	.0505	<u>240,200</u>	<u>12,100</u>	<u>69,400</u>	<u>3,500</u>
TOTAL CONSTRUCTION COST	--	--	\$1,886,800	\$ 98,800	\$639,800	\$ 34,700
TOTAL MAINTENANCE COST	--	--	--	4,100	--	3,100
TOTAL ROAD USER COST	--	--	--	105,400	--	127,400
TOTAL ANNUAL COST	--	--	--	\$208,300	--	\$165,200

